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Spectroscopic study of the effect of N and F codoping on the spatial distribution of Er3+ dopant ions in vitreous SiO2

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Abstract

Pulsed electron paramagnetic resonance (EPR) spectroscopy has been used to study the influence of codoping with N and/or F on the clustering of Er 3+ ions in vitreous SiO2. Measurements of echo-detected EPR, spin-lattice and phase memory relaxation times, and electron spin-echo envelope modulation (ESEEM) were made in the X band. Er-N, Er-F, and Er---F codoped glasses show clear evidence of clustering of Er3+ ions at concentration levels ranging between 6.67 × 1018 cm -3 and 6.67 × 1019 cm-3. However, the relatively long phase memory relaxation time and the observability of ESEEM in the Er-N-F codoped glass strongly indicate that combined codoping with N and F is more effective in homogenization of the spatial distribution of Er 3+ ions in vitreous SiO2, although, the structural mechanism remains unclear. The ESEEM results provide evidence in favor of the presence of N in the vicinity of the Er3+ ions in Er-N-F codoped vitreous SiO2. © 2007 American Institute of Physics.

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